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Description

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~~Program-controlled apparatus~~

The present invention relates generally to a program-controlled apparatus in accordance with the preamble to claim 1; in particular, the present invention relates to a data processing or telecommunications apparatus controlled by means of software.

Program-controlled apparatuses or systems comprise system hardware in order to perform or carry out particular functions of the program-controlled apparatus. The system hardware is supplemented by system software, which provides operating data for the operation of the program-controlled apparatus and thus represents the basis for control of the system hardware. In known program-controlled telecommunications systems, copy protection in the form of the so-called dongle concept is then used in order to ensure that the system software is used only together with that system hardware for which the user has also purchased licenses. This is intended to prevent unauthorized copying of the system software from individual system hardware to other system hardware.

With the dongle concept, the system checks at startup whether the dongle has been placed or plugged into the system. If this is not the case, the system cannot be operated. The problem with this concept, however, is the fact that the dongle is removable and can thus be placed into another system for which no license has actually been purchased, so that the correlation check for the hardware and software of a system can be artificially corrupted. There is therefore a need for an improved concept which ensures that the system software

can be used only insofar as it is also covered by licenses.

The present invention is therefore based on the object of specifying an improved program-controlled apparatus which reliably prevents unauthorized copying of the system software and/or unauthorized use of the system software.

The present invention achieves this object by means of a program-controlled apparatus having the features of claim 1. The dependent claims describe preferred and advantageous refinements of the present invention, which, for their part, contribute to improved protection of the system software.

According to the present invention, the program-controlled apparatus is used together with memory means, for example in the form of a crypto chip, which store individual user data stipulating and defining the possible scope of use of the system software for the respective user. When the program-controlled apparatus is put into operation, this user data is read out and made the basis for control of the system hardware, such that the system hardware is driven by the system software only within the scope of use defined by the individual user data. In this way, only predefined service features or a particular number of applications of the system software may be enabled for particular users.

If the memory means are produced in the form of a crypto chip, said crypto chip may be incorporated, by way of example, in the multilayer backplane of the central processor unit of the apparatus, so that it is permanently connected to the central processor unit, i.e. the system software, locally and is particularly difficult to access. When the program-controlled

apparatus is delivered, customer-specific keys or algorithms are programmed in this chip, for example, so that the system software delivered with the apparatus is able to run only within the scope defined by the programmed keys/algorithms. Although the system software and the associated database for the program-controlled apparatus may preferably be copied for backup purposes, in this way they are not able to run on other systems or apparatuses without the crypto chip.

So that diagnosis/maintenance of the program-controlled apparatus can still be carried out, an external smart card reader, for example, may be connected for this purpose, so that the entire system software is accessible again when an authorized person's appropriate smart card is inserted. The use of other identification means for diagnosis/maintenance purposes is likewise conceivable, said other identification means allowing a check on the entry of a particular code authorizing diagnosis/maintenance.

The present invention may be applied to various types of program-controlled apparatuses, one preferred area of application being that of data processing or telecommunications apparatuses. In particular, the present invention may be used in telecommunications systems used in private networks for setting up communications links between subscribers associated with the telecommunications system.

The present invention is explained in more detail below with the aid of a preferred illustrative embodiment and with reference to the appended drawing.

Figure 1 shows a simplified block diagram of a program-controlled apparatus in the form of a program-controlled telecommunications system, and

Figure 2 shows a simplified block diagram of the control device shown in Figure 1 in accordance with the present invention.

Although the present invention can be applied generally to program-controlled apparatuses of various types in which hardware and software are provided separately from one another, the invention will be explained in more detail below with particular reference to a telecommunications system.

Figure 1 shows a simplified block diagram of a telecommunications system 1, such as is used in private communications networks, for example. The telecommunications system 1 is used for switching voice, image, text and data connections between the subscribers associated with the telecommunications system 1. The telecommunications system 1 preferably operates digitally, i.e. digital information transmission takes place within the telecommunications system 1.

The telecommunications system 1 comprises, as central hardware device, a digital switching network 4, which represents the actual switching element in the telecommunications system 1. The switching network 4 allows so-called position-based switching from one transmission line connected to the telecommunications system 1 to another transmission line, and so-called time-based switching from one transmission channel to another transmission channel. The digital switching network 4 is generally split into individual switching network modules or switching stages.

The telecommunications system 1 has different associated subscribers and transmission lines connected to the digital switching network 4 via line terminations 2a-2c. If necessary, the line terminations 2a-2c perform analogue/digital conversion in the incoming direction and digital/analogue conversion in the outgoing

direction. The line terminations 2a-2c can be connected to the digital switching network 4 by means of PCM transmission lines, for example, having 64 channels, for example. For the sake of simplicity, Figure 1 shows a plurality of subscriber lines 3 only for the line termination 2a, these subscriber lines being able to be associated both with analogue and digital subscriber terminals. Naturally, the line terminations 2b and 2c are each connected to a multiplicity of subscriber lines 3 as well.

The telecommunications system 1 is program-controlled. This is done using a controller 5 which receives the requests for connections from the subscribers in the telecommunications system 1, sets the paths and controls the entire telecommunications system 1, in particular the hardware, i.e. the switching network 4, of the telecommunications system 1.

The design of the controller 5 shown in Figure 1 will be explained in more detail below with reference to Figure 2.

The central module in the controller 5 is a central control unit (CPU) 6 in the form of a central processor used to drive the system hardware in the telecommunications system 1. The central control unit 6 is program-controlled and, for this purpose, is driven by a piece of system software 7 which provides a particular database containing operating data for operating the system hardware. In this way, the system hardware or the telecommunications system 1 can be provided for a multiplicity of service features LM # 1 - LM # n defined by the system software 7 or its database, with the system software 7, in particular, prescribing for each service feature the operating parameters it requires. With reference to Figure 2, this means that the first service feature LM # 1 may be produced with three different operating parameters 1-A

to 1-C, for example, whereas only two different operating parameters

2-A and 2-B are possible for the second service feature LM # 2. Overall, the system software 7 thus equips the telecommunications system 1 to produce n service features. These service features may be generally known facilities for digital telephone networks, such as "call waiting", "call diversion", "call forwarding", "calling line identification presentation" or "advice of charge", etc. The system software 7 or the corresponding database thus provides the central control unit 6 with all the operating information necessary for operating the telecommunications system 1, so that the telecommunications system 1 or its system hardware can be program-controlled.

The system software 7 and the associated database can be copied by the respective user for backup purposes. However, to ensure that the system software 7 or its database is not able to run on other systems or telecommunications systems with different system hardware, the central control unit 6 in the telecommunications system 1 is coupled to an additional memory 8, which contains individual user data. In particular, this memory 8 may be a crypto chip, as is generally used in connection with smart cards. The memory 8 is permanently coupled to the central control unit 6 locally and, by way of example, is incorporated in the multilayer backplane of the central control unit 6, so that the memory 8 cannot be isolated from the central control unit 6.

When the telecommunications system or the program-controlled apparatus is delivered, the aforementioned individual user data is programmed, i.e. stored, in this memory 8, said individual user data comprising, by way of example, customer-specific keys or algorithms and defining the respective

user's possible scope of use of the system software or of the telecommunications system.

Since the memory 8 is permanently, i.e. not removably, coupled to the system software or the central control unit 6, self-identification of the system hardware using the memory 8 or the information stored in it is possible, so that an unambiguous 1:1 association between the system software and the system hardware in the telecommunications system is provided, and the system software 7 is assured not to be able to run on another telecommunications system, i.e. in conjunction with other system hardware. Since, in particular, the memory 8 is permanently coupled to the central control unit 6, the problem described in the introduction regarding the dongle concept, which arises on account of the interchangeability of the dongle, is not encountered on the basis of the present invention.

As Figure 2 shows, the individual user data stored in the memory 8 comprises, in particular, information stipulating the respective user's possible scope of use of the system software 7. The user data stored in the memory 8 can thus stipulate which of the service features offered by the telecommunications system or the system software 7 are accessible for the respective user, and how many different applications are covered by the license associated with the memory or the crypto chip 8. In the example shown in Figure 2, by way of example, the user has access only to service features LM # 1 and LM # 3, with service feature LM # 1 additionally being able to be operated only with parameters 1-A and 1-C, for example, whereas service feature LM # 3 can be accessed by the user only with operating parameter 3-B. This ensures that the system software 7 delivered with the system hardware is able to run only within the

scope ordered by the respective user beforehand.

Despite the restriction of the scope of use by the user data stored in the memory 8, the case may arise that the entire system software 7 needs to be accessed for diagnosis or maintenance purposes. For this purpose, the central control unit 6 can be coupled to an interface 9 to which, by way of example, an external smart card reader may be connected, so that an authorized person can identify himself to the telecommunications system or to the central control unit 6 using a special smart card and can cancel the restrictions on the system software 7 which are prescribed by the memory 8. Of course, it is also possible to use other identification means allowing identification of a person authorized to access the entire system software 7 or its entire database. Thus, by way of example, provision may be made for a keyboard entry instead of a smart card reader, on which basis entry of an appropriate access code removes the restrictions in the memory 8 and the authorized person can access the entire system software 7.